

Multi-Resolution Climate Modeling

Principal Investigator
Ferdinand Baer

Co-Principal Investigators
Joseph J. Tribbia
Aimé Fournier

This project will create a global climate model with features that provide the best available climate predictions on regional as well as global scales, since regional climate events may be the predominant manifestations of global climate change. Concurrent with developing a model that can predict climate "seamlessly" across many scales, one must acknowledge the inherent variability of a model, which can only overcome by using statistics from a number of model climate realizations. Thus model computations must be as rapid as possible to provide these statistics in a practically useful time frame.

The method proposed herein for construction of the model is ideally suited to satisfy the requirements outlined above. By tiling the spherical domain with elements that can be sized arbitrarily to meet local scaling requirements (called spectral elements), the model can produce predictions on a range of scales over the entire global domain, allowing necessary scale interactions without user interference in the computational process. The method takes optimum advantage of parallel processing by minimizing communications amongst the elements and processors. This procedure has yielded dramatic speedup of the dynamics computations, making the production of multiple realizations more feasible. Finally, the model will serve as a research and training tool.

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